Difficult Abdominal Closure

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Illustrative case

14 yo boy with delayed diagnosis of appendicitis

Appendectomy 2 wk after onset of symptoms

POD4: return to OR for midline laparotomy and drainage of multiple abscesses

POD6: return to OR for cleanout; more abscesses

POD9: transfer to tertiary center with Dx of abdominal compartment syndrome

Images courtesy of D.H. Wittmann, MD
Difficult Abdominal Closure

– Overview –

- Etiology
- Clinical significance
- Treatment options
  (Artificial bur)

- Summary/Recommendations
Difficult Abdominal Closure
—Etiology—

- Visceral edema
- Loss of abdominal wall
- Intraabdominal sepsis
Difficult closure 2° visceral edema

- Shock
- Fluid overload
- Prolonged operation

Trauma, 3rd ed.
Difficult closure $2^{°}$ abdominal wall loss

- Trauma
- Infection
- Tumor

Am J Surg 2001;181:115
Difficult closure 2° intraabdominal sepsis

- Neglected perforation
- Infected pancreatic necrosis
Difficult Abdominal Closure
—Clinical Significance—

• Consequences of forced 1° closure
• Consequences of an open abdomen
Consequences of forced 1° closure

• Fascial dehiscence
• Abdominal compartment syndrome
Abdominal Compartment Syndrome

• Definition/Diagnosis
• Predisposing conditions
• Pathophysiology
• Treatment
Abdominal Compartment Syndrome

—Definition—

Intraabdominal hypertension
+
organ dysfunction
Abdominal Compartment Syndrome – Diagnosis –

**IAP**

normal:  
< 10 mm Hg

elevated:  
> 20 mm Hg (sustained)
Abdominal Compartment Syndrome

–Diagnosis–

1. Cardiac, pulmonary, and/or renal dysfunction not easily explained by other conditions

2. Sustained elevation of intraabdominal pressure
Abdominal Compartment Syndrome

–Predisposing Conditions–

• Resuscitated hypovolemic shock (trauma, burns)

• Intraabdominal sepsis (pancreatitis, perforation)

• Space occupying lesion (obstruction, blood, ascites, lap pads, pneumoperitoneum)
Abdominal Compartment Syndrome
—Pathophysiology—

INCREASED ABDOMINAL PRESSURE

Compression of kidneys

↓ Renal blood flow
↓ UOP

↓ Venous return

↓ CO
↓ VEDV
↓ SV
↑ SVR

↑ Intrathoracic pressures

↑ ICP

Hypoxemia
↑ Airway pressures
↓ Compliance
↑ PA pressures
↑ CVP readings

Current Surgical Therapy, 7th ed.
Abdominal Compartment Syndrome
– Treatment –

1. Fluid resuscitation
2. Decompression
Difficult Abdominal Closure
—Clinical Significance—

Consequences of an open abdomen

- Fluid and protein loss
- Enterocutaneous ("enteroatmospheric") fistula
- Ventral hernia
Difficult Abdominal Closure
–Treatment options–

Treatment disclaimer:

It’s all retrospective data
Difficult Abdominal Closure – Treatment options –

Initial management of defect = some sort of coverage

- Primary Closure (retentions)
- Skin closure (clips)
- Plastic closure
- Absorbable mesh closure
- Nonabsorbable mesh closure
- Artificial bur (Wittmann Patch™)
Primary fascial closure with retention sutures
Treatment options

Skin closure with towel clips
Treatment options

Plastic silo or “Bogota” bag
(Irrigation fluid bag)
-Treatment options-

Double layer of Steri-Drape
-Treatment options-

Plastic sheet coverage with sump drains
Plastic sheet coverage with sump drains
Variant:

Closure with Rayon mesh
Treatment options

Closure with absorbable mesh
(Planned Ventral Hernia)

fistula rate with long-term placement without coverage = 25-50%
Planned Ventral Hernia
Planned Ventral Hernia

“Pinching” the STSG

Closure with nonabsorbable mesh (polypropylene)

fistula rate with long-term placement without coverage = 20-100%
Treatment options—
Artificial bur closure
Declaration:

no financial relationship with Star Surgical, Inc.
Artificial bur

10 x 40 cm upper hook sheet (polypropylene)

20 x 40 cm lower loop sheet (polyamide)

Sheets are trimmable to wound size

Velcro-like closure (loops and hooks)

Bursting strength exceeds fascia

FDA approval 2000

Images courtesy of Star Surgical, Inc. and D.H. Wittmann, MD
Artificial bur

mushroom-shaped hook (polypropylene sheet)  nylon loop (polyamide sheet)
Artificial bur

polyamide sheet

polypropylene sheet
Artificial bur

- Repeat explorations q1-3 days
- Control of sepsis and/or hemorrhage
- Avoidance of ACS
- Decreased risk of fistula (?)
- Inspection of healing
- Incremental fascial closure over 1-3 weeks
Artificial bur

Management of a leaking colonic anastomosis with sepsis
Colonic anastomotic leak with sepsis
Artificial bur

Visceral edema 2° to penetrating trauma
Artificial bur
Gradual fascial approximation
Artificial bur unit cost:

$1,370

(Check out local fabric store)
Difficult Abdominal Closure
–Treatment options–

Final closure =

elective management of giant ventral hernia

(another talk)
Giant Ventral Hernia Management

• Repair with autologous tissue
• Prosthetic repair
• Relaxing incisions
• Preoperative tissue expansion
• Preoperative pneumoperitoneum
Ventral Herniorrhaphy
–Retromuscular technique–

Stoppa, Rives, Flament (France)
Wantz (U.S.)

→ 3/206 recurrence rate (1.5%)

Difficult Abdominal Closure
–Summary/Recommendations–

1. Avoid the forced fascial closure
2. Multiple choices of temporary closure
3. Early intestinal coverage
4. Delayed 1° fascial closure is desirable